

Claims

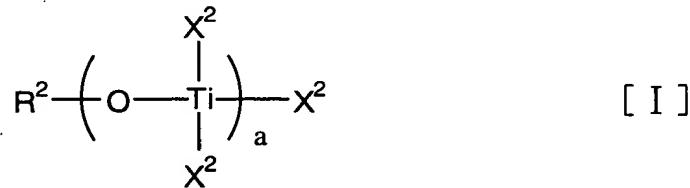
1. A process for producing a solid catalyst component (1) for  $\alpha$ -olefin polymerization, which comprises the steps of:

5 (1) reducing a titanium compound represented by the following formula [I] with an organomagnesium compound in the presence of an organosilicon compound having an Si-O bond, thereby obtaining a solid product, and

(2) contacting the solid product with a halogeno

10 compound of the 14 group element, at least one member selected from the group consisting of an electron donor compound (E1) and an organic acid halide, and a compound having a Ti-halogen bond, thereby obtaining the solid catalyst component (1) for  $\alpha$ -olefin polymerization,

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wherein "a" is a number of 1 to 20,  $R^2$  is a hydrocarbon group having 1 to 20 carbon atoms, and  $X^2$  is a halogen atom or a

20 hydrocarbyloxy group having 1 to 20 carbon atoms, and all of  $X^2$  may be the same or different from one another.

2. The process for producing a solid catalyst component (1) for  $\alpha$ -olefin polymerization according to Claim 1, wherein

25 the step (2) comprises:

(i) contacting the solid product with the electron donor compound (E1) to obtain a contacted product, and

(ii) contacting the contacted product obtained with the halogeno compound of the 14 group element and a compound having a Ti-halogen bond.

3. The process for producing a solid catalyst component (1) for  $\alpha$ -olefin polymerization according to Claim 1, wherein the step (2) comprises:

10 (i) contacting the solid product with the compound having a Ti-halogen bond and the organic acid halide to obtain a contacted product, and

(ii) contacting the contacted product obtained with the halogeno compound of the 14 group element, the electron donor compound (E1) and the compound having a Ti-halogen bond.

4. The process for producing a solid catalyst component (1) for  $\alpha$ -olefin polymerization according to Claim 1, wherein the step (2) comprises:

20 (i) contacting the solid product with a mixture of the compound having a Ti-halogen bond and an ether to obtain a contacted product,

(ii) contacting the contacted product obtained in the  
above (i) with the organic acid halide to obtain a contacted  
product,

(iii) contacting the contacted product obtained in the above (ii) with a mixture of the halogeno compound of the 14 group element, a carboxylic acid ester and an ether to

obtain a contacted product, and

(iv) contacting two times the contacted product obtained in the above (iii) with a mixture of the compound having a Ti-halogen bond and an ether.

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5. The process for producing a solid catalyst component (1) for  $\alpha$ -olefin polymerization according to Claim 1, wherein the step (2) comprises:

10 (i) contacting the solid product with a mixture of the compound having a Ti-halogen bond and an ether to obtain a contacted product,

(ii) contacting the contacted product obtained in the above (i) with the organic acid halide to obtain a contacted product,

15 (iii) contacting the contacted product obtained in the above (ii) with a mixture of the compound having a Ti-halogen bond, a carboxylic acid ester and an ether to obtain a contacted product,

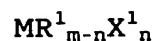
20 (iv) contacting the contacted product obtained in the above (iii) with a mixture of the halogeno compound of the 14 group element and an ether to obtain a contacted product, and

25 (v) contacting the contacted product obtained in the above (iv) with a mixture of the compound having a Ti-halogen bond and an ether.

6. The process for producing a solid catalyst component

(1) for  $\alpha$ -olefin polymerization according to Claim 1, wherein

the halogeno compound of the 14 group element contains a compound represented by the following formula,



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wherein M is an atom belonging to the 14 group,  $R^1$  is a hydrocarbon group having 1 to 20 carbon atoms,  $X^1$  is a halogen atom, m is a valence of M, and n is a number satisfying  $0 < n \leq m$ .

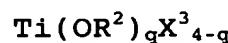
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7. The process for producing a solid catalyst component (1) for  $\alpha$ -olefin polymerization according to Claim 6, wherein M contains a silicon atom.

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8. The process for producing a solid catalyst component (1) for  $\alpha$ -olefin polymerization according to Claim 1, wherein the titanium compound contains a compound represented by the following formula,

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wherein  $R^2$  is a hydrocarbon group having 1 to 20 carbon atoms,  $X^3$  is a halogen atom, and q is a number satisfying  $0 < q \leq 4$ .

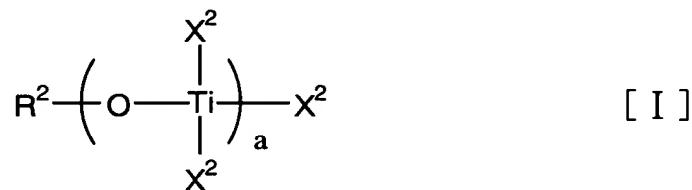
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9. The process for producing a solid catalyst component (1) for  $\alpha$ -olefin polymerization according to Claim 1, wherein "a" in the formula [I] is 2 or 4.

10. A process for producing a solid catalyst component (2) for  $\alpha$ -olefin polymerization, which comprises the steps of:  
(1) reducing a titanium compound represented by the  
5 following formula [I] with an organomagnesium compound in the presence of an organosilicon compound having an Si-O bond and an ester compound, thereby obtaining a solid product, and

10 (2) contacting the solid product with a halogeno compound of the 14 group element, at least one member selected from the group consisting of an electron donor compound (E1) and an organic acid halide, and a compound having a Ti-halogen bond, thereby obtaining the solid catalyst component (2) for  $\alpha$ -olefin polymerization,

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wherein "a" is a number of 1 to 20,  $\text{R}^2$  is a hydrocarbon group having 1 to 20 carbon atoms, and  $\text{X}^2$  is a halogen atom or a 20 hydrocarbyloxy group having 1 to 20 carbon atoms, and all of  $\text{X}^2$  may be the same or different from one another.

11. The process for producing a solid catalyst component (1) for  $\alpha$ -olefin polymerization according to Claim 10, wherein  
25 the step (2) comprises:

(i) contacting the solid product with the electron donor compound (E1) to obtain a contacted product, and

(ii) contacting the contacted product obtained with the halogeno compound of the 14 group element and the compound having a Ti-halogen bond.

## 12. The process for producing a solid catalyst component

(1) for  $\alpha$ -olefin polymerization according to Claim 10, wherein the step (2) comprises:

10 (i) contacting the solid product with the compound  
having a Ti-halogen bond and the organic acid halide to obtain  
a contacted product, and

(ii) contacting the contacted product obtained with the halogeno compound of the 14 group element, the electron donor compound (E1) and the compound having a Ti-halogen bond.

### 13. The process for producing a solid catalyst component

(1) for  $\alpha$ -olefin polymerization according to Claim 10, wherein the step (2) comprises:

20 (i) contacting the solid product with a mixture of the compound having a Ti-halogen bond and an ether to obtain a contacted product,

(ii) contacting the contacted product obtained in the above (i) with the organic acid halide to obtain a contacted product,

(iii) contacting the contacted product obtained in the above (ii) with a mixture of the halogeno compound of the 14 group element, a carboxylic acid ester and an ether to

obtain a contacted product, and

(iv) contacting two times the contacted product obtained in the above (iii) with a mixture of the compound having a Ti-halogen bond and an ether.

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14. The process for producing a solid catalyst component (1) for  $\alpha$ -olefin polymerization according to Claim 10, wherein the step (2) comprises:

10 (i) contacting the solid product with a mixture of the compound having a Ti-halogen bond and an ether to obtain a contacted product,

(ii) contacting the contacted product obtained in the above (i) with the organic acid halide to obtain a contacted product,

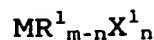
15 (iii) contacting the contacted product obtained in the above (ii) with a mixture of the compound having a Ti-halogen bond, a carboxylic acid ester and an ether to obtain a contacted product,

20 (iv) contacting the contacted product obtained in the above (iii) with a mixture of the halogeno compound of the 14 group element and an ether to obtain a contacted product, and

25 (v) contacting the contacted product obtained in the above (iv) with a mixture of the compound having a Ti-halogen bond and an ether.

15. The process for producing a solid catalyst component (1) for  $\alpha$ -olefin polymerization according to Claim 10, wherein

the halogeno compound of the 14 group element contains a compound represented by the following formula,



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wherein M is an atom belonging to the 14 group,  $R^1$  is a hydrocarbon group having 1 to 20 carbon atoms,  $X^1$  is a halogen atom, m is a valence of M, and n is a number satisfying  $0 < n \leq m$ .

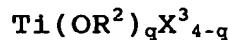
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16. The process for producing a solid catalyst component (1) for  $\alpha$ -olefin polymerization according to Claim 15, wherein M contains a silicon atom.

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17. The process for producing a solid catalyst component (1) for  $\alpha$ -olefin polymerization according to Claim 10, wherein the titanium compound contains a compound represented by the following formula,

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wherein  $R^2$  is a hydrocarbon group having 1 to 20 carbon atoms,  $X^3$  is a halogen atom, and q is a number satisfying  $0 < q \leq 4$ .

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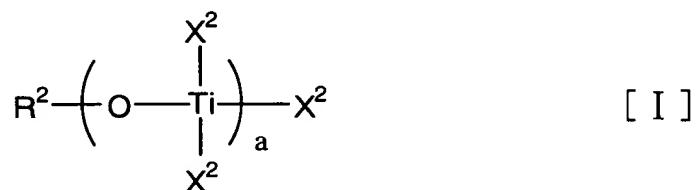
18. The process for producing a solid catalyst component (1) for  $\alpha$ -olefin polymerization according to Claim 10, wherein "a" in the formula [I] is 2 or 4.

19. A process for producing a catalyst (1) for  $\alpha$ -olefin polymerization, which comprises the steps of:

(1) reducing a titanium compound represented by the  
5 following formula [I] with an organomagnesium compound in  
the presence of an organosilicon compound having an Si-O bond,  
thereby obtaining a solid product,

(2) contacting the solid product with a halogeno compound of the 14 group element, at least one member selected from the group consisting of an electron donor compound (E1) and an organic acid halide, and a compound having a Ti-halogen bond, thereby obtaining a solid catalyst component (1) for  $\alpha$ -olefin polymerization, and

(3) contacting the solid catalyst component (1), an  
15 organoaluminum compound and an electron donor compound (E2)  
with one another, thereby obtaining the catalyst (1) for  $\alpha$ -  
-olefin polymerization.



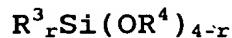
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wherein "a" is a number of 1 to 20,  $R^2$  is a hydrocarbon group having 1 to 20 carbon atoms, and  $X^2$  is a halogen atom or a hydrocarbyloxy group having 1 to 20 carbon atoms, and all of  $X^2$  may be the same or different from one another.

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20. The process for producing a catalyst (1) for  $\alpha$ -olefin polymerization according to Claim 19, wherein the electron donor compound (E2) contains an alkoxysilicon compound represented by the following formula,

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wherein  $R^3$  is a hydrocarbon group having 1 to 20 carbon atoms or a hydrogen atom,  $R^4$  is a hydrocarbon group having 1 to 20 carbon atoms,  $r$  is a number satisfying  $0 < r \leq 4$ , and all of  $R^3$  and all of  $R^4$  may be the same or different from one another, respectively.

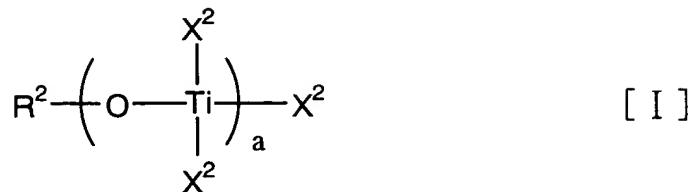
10 21. A process for producing a catalyst (2) for  $\alpha$ -olefin polymerization, which comprises the steps of:

15 (1) reducing a titanium compound represented by the following formula [I] with an organomagnesium compound in the presence of an organosilicon compound having an Si-O bond and an ester compound, thereby obtaining a solid product,

20 (2) contacting the solid product with a halogeno compound of the 14 group element, at least one member selected from the group consisting of an electron donor compound (E1) and an organic acid halide, and a compound having a Ti-halogen bond, thereby obtaining a solid catalyst component (2) for  $\alpha$ -olefin polymerization, and

25 (3) contacting the solid catalyst component (2), an organoaluminum compound and an electron donor compound (E2) with one another, thereby obtaining the catalyst (2) for  $\alpha$

-olefin polymerization.



5 wherein "a" is a number of 1 to 20,  $\text{R}^2$  is a hydrocarbon group having 1 to 20 carbon atoms, and  $\text{X}^2$  is a halogen atom or a hydrocarbyloxy group having 1 to 20 carbon atoms, and all of  $\text{X}^2$  may be the same or different from one another.

10 22. The process for producing a catalyst (2) for  $\alpha$ -olefin polymerization according to Claim 21, wherein the electron donor compound (E2) contains an alkoxysilicon compound represented by the following formula,



wherein  $\text{R}^3$  is a hydrocarbon group having 1 to 20 carbon atoms or a hydrogen atom,  $\text{R}^4$  is a hydrocarbon group having 1 to 20 carbon atoms,  $r$  is a number satisfying  $0 < r \leq 4$ , and all 20 of  $\text{R}^3$  and all of  $\text{R}^4$  may be the same or different from one another, respectively.

23. A process for producing an  $\alpha$ -olefin polymer, which comprises the steps of:

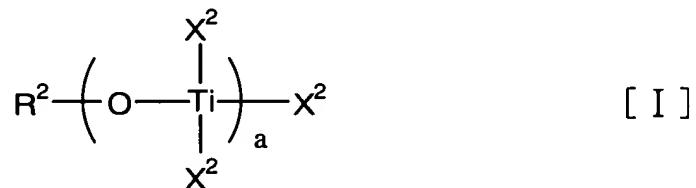
25 (1) reducing a titanium compound represented by the

following formula [I] with an organomagnesium compound in the presence of an organosilicon compound having an Si-O bond compound, thereby obtaining a solid product,

(2) contacting the solid product with a halogeno 5 compound of the 14 group element, at least one member selected from the group consisting of an electron donor compound (E1) and an organic acid halide, and a compound having a Ti-halogen bond, thereby obtaining a solid catalyst component (1) for  $\alpha$ -olefin polymerization,

10 (3) contacting the solid catalyst component (1), an organoaluminum compound and an electron donor compound (E2) with one another, thereby obtaining a catalyst (1) for  $\alpha$ -olefin polymerization, and

15 (4) subjecting an  $\alpha$ -olefin to homopolymerization or copolymerization in the presence of the catalyst (1).



wherein "a" is a number of 1 to 20,  $\text{R}^2$  is a hydrocarbon group 20 having 1 to 20 carbon atoms, and  $\text{X}^2$  is a halogen atom or a hydrocarbyloxy group having 1 to 20 carbon atoms, and all of  $\text{X}^2$  may be the same or different from one another.

24. A process for producing an  $\alpha$ -olefin polymer, which 25 comprises the steps of:

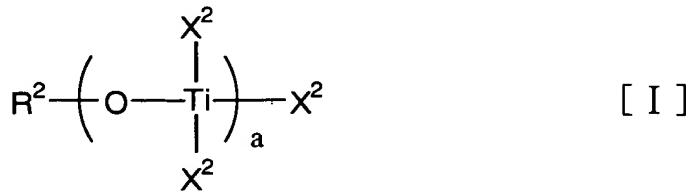
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      (1) reducing a titanium compound represented by the following formula [I] with an organomagnesium compound in the presence of an organosilicon compound having an Si-O bond and an ester compound, thereby obtaining a solid product,

5      (2) contacting the solid product with a halogeno compound of the 14 group element, at least one member selected from the group consisting of an electron donor compound (E1) and an organic acid halide, and a compound having a Ti-halogen bond, thereby obtaining a solid catalyst component (2) for  
10  $\alpha$ -olefin polymerization,

      (3) contacting the solid catalyst component (2), an organoaluminum compound and an electron donor compound (E2) with one another, thereby obtaining a catalyst (2) for  $\alpha$ -olefin polymerization, and

15      (4) subjecting an  $\alpha$ -olefin to homopolymerization or copolymerization in the presence of the catalyst (2).

      In the present invention, the solid catalyst components (1) and (2) for  $\alpha$ -olefin polymerization are hereinafter together referred to as "solid catalyst component" for brevity, and  
20 the catalysts (1) and (2) for  $\alpha$ -olefin polymerization are also hereinafter together referred to as "catalyst" for brevity,



wherein "a" is a number of 1 to 20, R<sup>2</sup> is a hydrocarbon group having 1 to 20 carbon atoms, and X<sup>2</sup> is a halogen atom or a hydrocarbyloxy group having 1 to 20 carbon atoms, and all 5 of X<sup>2</sup> may be the same or different from one another.

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